Research Focus

By Benjamin Scott and Julio Giordano

Factors that affect the viability and longevity of dairy cattle

Field study of 55 NY herds reviews factors associated with increased mortality or culling risk, from calves to mature cows.

Many factors are known or suspected to influence the health, production, or reproduction of dairy cattle, thereby increasing the likelihood of death or herd removal (generally referred to as culling). These factors can be categorized and evaluated as herd-level or animal-based. Herd-level factors are climatic, economic, facility or management practice conditions that may lead to an increased rate of culling among particular age groups of dairy cattle. Animal-based factors represent the records known of individual animals that serve to indicate the survival probability of an animal relative to her peers. Herd-level factors often influence metrics that are captured through animal-based factors. Therefore, the investigation of either cannot be considered fully independent, although both are important.

Research approach. The on-farm recording of test-day information and life events of dairy cattle allow researchers to efficiently explore and organize these factors. Pairing the data from approximately 180,000 dairy cattle on 55 farms with a survey questionnaire that established facility and management factors for cattle in each herd in 2013 and 2014, we evaluated the hypothesis that a multitude of these herd-level and animal-based factors were associated with an increased risk of culling. Records were organized for each animal's current status in the herd, resulting in decreasing animal numbers for evaluation on older heifers or late lactation milk cows. Figure 1 illustrates the risk periods evaluated for calves and heifers in 2013 and 2014 and the risk periods evaluated for lactating cattle in 2014.

Approximately 30 factors were evaluated for each risk period and were chosen specifically for their potential influence in that particular risk period. These included pre and post-weaning nutrition practices for calves, housing types, stocking densities, feeding practices and manger space for all cattle, commingling of heifers or first lactation animals with older animals during the transition period and lactation, and general herd management approaches and goals. Also included were health event records for some of the dairies with similar definitions of ketosis (KET), metritis (MET), milk fever (MF), displaced abomasum (DA), retained placenta (RP), diarrhea, pneumonia, mastitis, and lameness, as well as test-day information for lactating cows from all herds.

Results. Factors that were linked to an increase in culling risk are summarized for each animal in Table 1. All factors listed have a statistical association of $P<0.05$. All animal-based factors can be considered indicative of subsequent increased mortality risk or voluntary culling due to lack of financial viability relative to herdmates. Non-significant animal-based factors may suggest the lack of detrimental prognosis for an animal that was exposed to any given factor. Herd-level factors presumably result in a general increase of exposure risk to some of the same animal-based factors listed in Table 1, as well as others. For example, results of the primiparous and multiparous culling risk analyses support that in the life of a lactating dairy cow, herd-level risk factors may shift from social dynamics (bunk space, commingling) to factors more specific to locomotion and udder health (bedding depth and type) with age. In general, reducing the exposure frequency or severity of effect from these factors within a dairy population will either allow for more herd growth, reduce the scale of need for herd replacements, or enhance the quality and price of an animal removed from the dairy. ❐

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Table 1: Factors associated with an increased culling risk for various age classes and risk periods.

	Herd-level factors	Animal-based factors
Calves and heifers		
0-150 days of age (n=48,316)	birth year (higher risk in 2014 than 2013)	colder birth months (higher risk in colder months)
		record of pneumonia or diarrhea before 150 days of age
151-360 days of age (n= 25,401)	birth year (higher risk in 2014 than 2013)	record of pneumonia or diarrhea before 150 days of age
		record of pneumonia or diarrhea from 151-360 days of age
361-600 days of age (n= 3,177)		reproductive performance (delayed conception or abortion)
		record of pneumonia or diarrhea from 361-600 days of age
Primiparous cows		
0-60 days in milk (n= 22,685)	lower prepartum bunk space access (<28 inches/head vs. more)	younger (<21) and older (>24.5) months age at first calvin
	fewer years of experience of herd health manager	record of DA, RP, or KET
		non-summer calving months
		lower 1st test-day milk production and milk true protein concentration
		higher 1st test-day milk fat concentration and linear score
61-300 days in milk (n= 5,877)	Commingling in lactating pens	reproductive performance (delayed conception or abortion)
		record of RP, mastitis, indigestion or diarrhea, or pneumonia
		lower 3rd test-day milk production and elevated linear score from 3rd to 10th test-days
Multiparous cows		
0-60 days in milk (n= 40,897)	lower bedding depth (<2.5 inches per stall vs. more)	increasing parity
		long (>65) or short (<40) days dry
		summer calving months
		previous lactation information: greater days open and lower milk production
		record of DA, RP, MF, KET, or more than one disorder
		lower 1st test-day milk production and milk true protein concentration
		higher 1st test-day milk fat concentration and linear score
61-300 days in milk (n= 9,779)	lower bedding depth (<2.5 inches per stall vs. more)	reproductive performance (delayed conception or abortion)
	dairy manure solids bedding source (vs. others)	previous lactation information: greater days open and lower milk production
		lower 3rd test-day milk production and elevated linear score from 3rd to 10th test-days
		record of MF, KET, pneumonia, indigestion or diarrhea, or mastitis